ZERO RETRIES

JOURNAL OF THE

Northwest Amateur Packet Radio Association

Vol. 2 No. 2 March/April 1986

RESOLVING ONE OF PACKET'S MYSTERIES

LOOKING CLOSELY AT THE DELETE COMMAND

by Budd Churcward, WB7FHC

Deep in the bowels of most of our TNCs there live nearly four score mysterious commands: parameters with which we can tinker and diddle; but few of us attempt many changes because of the uncertainty that lurks therein. "Besides," we say, "if it works don't fix it!"

When we fire up our TNCs for the first time, these commands are automatically set to values believed to be close to what most of us would require. These are called default values. They are stored within the memory of the EPROM chips and will remain the working parameters unless we elect to change them.

There is one command that defaults to a value that is incorrect for many of us users; yet goes unaltered because few understand it.

This command is called "DEL" for delete. It is toggled either "ON" or "OFF" and will automatically be set "ON" by your TNC.

If you have a "delete" key on your computer, you can correct misspelled words by tapping this key to remove incorrect letters. When the line is corrected you press the carriage return and the line is sent without errors.

The problem occurs when you don't have a "delete" key on your keyboard. Instead you have a "back space" which you attempt to use in the same way.

What few realize, is that the incorrect letters are then transmitted over the air, followed by control codes that will make most, but not all, computers backspace over them so that the correct word finally appears on the screen.

It would seem that many of us are operating with a terminal baud rate at 1200 or higher (the one between the computer and the TNC). At these speeds, the typo is but a flicker on the screen and goes undetected. A few packeteers running inexpensive computers with limiting software are forced to use slower baud rates. At 300 baud, it is easy to see the cursor move back and forth across the screen, often many times, until the correct letters appear.

Other computers, with more sophisticated software, may produce even stranger effects. The C-64s, for example, display control codes as reverse characters (backgrounds lit up with dark foregrounds). The typo is displayed followed by a control character for each time the backspace was touched and then the correct letters.

My computer displays a corrected word in another way. If you were trying to send the word: "radio" but found the typo: "rsdio" and corrected it before you sent the line I might see:

"rsdio^H^H^H^Hadio"

The solution to the problem, if you have it, is simple. Turn "DEL" off, and "PERM" it!

Computer equipment operates using a standard set of codes for 128

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characters and functions. Every printable symbol has its own code. These are often called ASCII codes (American Standard Code for Information Interchange). They are almost all the same no matter what brand of computer, printer, or peripheral you may have. For example, the letter "A" is code 65, the number "1" is 49, and the little "a" is 97.

In addition to the printable characters there are special functions that have codes, too. The line feed is code 10, the carriage return is 13, and sending a 7 will ring a bell or make a beep.

Some of these functions are not always standardized. For example if you send a "CONTROL-L" you will clear off the screen on many of the receiving computers; if someone is running a printer, it may eject a full page of paper. Yet other computers users will not know that it was sent.

In this set of ASCII codes there are two that perform similar tasks. One is code 127, for "DELETE" and the other is 8 for "backspace" (also known as CONTROL-H). Your keyboard may use either term to identify the key, or may simply have an arrow. In the latter case, you don't know if it is a "backspace" or a "delete".

You must configure your TNC to match the code your computer uses. Changing the parameter is easy, but knowing if you should, may take a little effort.

One approach is to connect to someone with a computer that displays the CONTROL characters, such as a friend with a PK64. Type five X's, backup and change them to five Z's. Send the line and ask your friend to report what is received. If any X's are visible, look at the "DEL" command in your TNC and reverse the parameter.

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If you want to see who has their parameter set incorrectly, try dropping the terminal baud rate, ABAUD, to 300 or less. Then watch your screen during any evening of packet activity. You will see your cursor dance back and forth often.

If you want to send special codes to other computers, refer to your user's manual for help. Usually there is a convenient list in an appendix. Many of the codes can be sent by holding the "CTRL" key down while touching a letter of the alphabet. For example you can send the code 13, your carriage return, by touching CTRL and M ("m" is the 13th letter of the alphabet). CTRL-J will send a line feed. CTRL-G will ring a bell.

If you are connected to a friend who is routing your text to a dot matrix printer, you might try beginning a line with CTRL-N. Many of them will print the line in double wide letters.

As you experiment with DEL and CONTROL characters with your TNC, be prepared for the unexpected. Many of them will surprise you. For example, if you are using a TNC-1, CTRL-E will place you in a DEBUG mode that will send you to the reset switch to get out.

Budd Churchward, WB7FHC
Editor

The new banner on page one was designed by John Hays, KD7UW, using a DOMAIN/LASER-26 printer and an Apollo computer. ZERO RETRIES is edited by Budd Churchward, WB7FHC, with the assistance and contributions of many others. Permission to reproduce all or part is granted. Please credit ZERO RETRIES and the authors.

E-Z PACKET 8Ø and Your TRS-8Ø Will Put The World of Packet Radio at Your Touch

Say, neighbor!! Are ya runnin' Packet on one o' them Radio Shack TRS-8Ø computers? An' are ya usin' one o' them dumb terminal programs where everything is all on one screen? Is your "ECHO" mode on, an' all your outgoing messages gettin' all scrambled up, kind o' like, with all the incoming stuff? An' are ya wonderin' when Packet is goin' to start bein' fun, bunky?

Well, wonder no more! The cavalry has arrived in the form of a new Packet terminal program created to take the labor out of Packet operation, give you split-screen operation and end all of those woes you've been having. It is called, appropriately enough, "E-Z PACKET 8Ø", and is brought to you by the same folks who originated the ROM-116 RTTY Terminal and software.

E-Z PACKET 8Ø offers split-screen operation from a TRS-8Ø Model 1, III 4, or 4P (upper 3/4 screen receive and bottom 1/4 transmit), either through the computer RS-232 interface, or through a ROM-116 RTTY Interface Unit. Full software and hardware handshaking between the computer and the TNC is supported. The program currently works with TNC's which operate with the TAPR TNC-1 style of commands, such as the TAPR TNC-1, the AEA PKT-1, the Heathkit HD-4Ø4Ø and the Kantronics Packet Communicator.

E-Z PACKET 8Ø contains 1Ø programmable line buffers, each capable of storing up to 14Ø characters; a 2ØØ character programmable TNC Initialization Text buffer; a 2ØØ character programmable Exit (TNC) Text buffer; a 2ØØ character programmable Connect Text buffer which automatically sends a message upon a connect; and there is a Main Text buffer, for pre-typed messages, which is 22k to 3Ok in length, depending on the particular computer you have. All of the buffers are accessible for modification at any time through a built-in editor, which operates similar to the TRS-8Ø BASIC editor. You can save incoming text from the TNC, to disk, or to the Main Text buffer; send the contents of the Main Text buffer to the TNC; save the Main Text buffer to disk, load any buffer from disk, and display any buffer, or an ASCII disk file to the screen or lineprinter.

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Other features of the program include the ability to customize your own version of the program and save it to disk, automatic connect link status checking, full binary file transfer support, clear the upper (receive) screen, and a programmable screen turn-off, which blanks the screen to prevent character burn-in on the CRT. And, if you have ever disconnected, wondering if your last packet had cleared the TNC, and watched the last half of your message fly over the network in UNPROTO mode (who hasn't done this?), you will appreciate the new remote acknowledgement capability. With this feature, if the other party ends his message with a <Control-W>, this program, upon receipt of the <Control-W>, will answer back with a message of "*** ACKNOWLEDGED", thus giving "early"

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TNC owners a way to see that the last packet has been successfully received.

The manual appears to be written for ease of reading. At the outset, very clear instructions are given for hardware implementation of the program, along with some parameters you have to PERM into the TNC to take advantage of the program's features. Step by step, you are guided through the process of getting the RS-232 wiring properly polarized, then through the booting of the program and into the MENU screens, which actually are a mini-manual in themselves. The amount of data on the menu screens is a bit overwhelming at first, but, as the manual points out, there are only 30 commands that operate the program, (the TAPR TNC-1 has over 70 commands, in comparison), plus 11 editing commands and 7 Control key functions. The MENU screens can be called upon at any time, so help is never far away.

Using the program turned out to be a breeze. When booted, the program comes up in the Copy mode, where all incoming data is stored in the Main Text buffer. Optionally, it could come up in the Disksave mode, depending on how you had customized and saved it. The Copy mode prevents loss of data that the TNC may have stored up, and will send to the computer when it receives the Initialization buffer. Unless you are running a slow terminal baud rate, or are a very fast reader, you may not be able to read everything from the TNC RAM before it scrolls off the screen. Going to the Copy mode first, allows you to peruse the text at your convenience. The Disksave mode allows you to

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create a copy of the program that will automatically boot up directly into the Disksave mode, with no operator intervention. This can be quite handy in the case of power glitches, when you are not there to reboot the program and place it in Disksave.

The first order of business, after initialization, was to program the Connect Text buffer. This buffer is sent out whenever someone connects with you and you are in the disksave mode. The 200 characters allows plenty of room for "cute" answering machine responses. Then the Exit Text buffer, which is issued any time you exit the program to DOS, was programmed. I chose the sequence of <Control-C> MON OFF <Control-S> to shut down the output from the TNC to the RS-232 interface, and also allow only connected messages to be stored in the TNC RAM. In the TNC Initialization Text buffer, I placed the sequence of <Control-Q> <Control-C> MON ON to restore the shutdown operation when booting the program again. This buffer, in addition to being sent automatically whenever booting the program, can also be sent manually, by the use of a <Control-@>. This is helpful, if you want to store other parameters you are fond of, so that you can restore the TNC from experimentation with a single keystroke. In the 10 available line buffers, which are also sent manually by a <Control-number> keystroke, I placed the calling sequences for my most often called stations in our LAN. Already, life on Packet was getting easier!

Where the program really lends some power to packeteering is in its file transfer mode. Two sta-

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tions, equipped with this software, can also transfer any disk file from one station to the other. All that is needed on each end is the command "RECVFILE" or "SENDFILE" and a filename. The program will automatically place the TNC in the Transparent mode, set the Parity to 4, set the Word length to 8 and commence transferring the file, using a MODEM7 type of protocol. When the transfer is complete, the program neatly flips the TNC back to Converse Mode.

Program distribution is being handled in a novel way, in hopes of promoting its widespread use more rapidly than conventional distribution schemes. The creators have adopted the "Freeware" method of getting the program around, similar to what is being done amongst the IBM users. You can actually get this program, legally, from a friend! However, if you want the manual for it, the program tells you to send $20.00 to the originators. If you don't have a friend who already has the program, you can just send the money straight to The Martin Co, P.O. Box 982, Marysville, WA 98270 and ask for both the program and the manual.

In summary, after several weeks of operation here, I have found the program to be everything that was described in the manual. It has certainly made Packet operation a joy for me, especially with the split screen operation, since conversations now seem to "flow" normally. I would heartily recommend its acquisition by anyone owning a TRS-80 computer.

Dennis Carpenter, KB7DY
Secretary, NAPRA

PTT LIGHT FOR THE TNC-2

In the last issue of the Packet Status Register (Oct 85) from TAPR, Tom Clark, W3IWI, presented a modification for the TNC-2, Rev. 1 boards. It described a simple change to make the 'PWR' LED serve double duty by adding a PTT function. This scheme modifies the LED driver circuitry to provide two brightness levels: bright while receiving and dim while transmitting. This will work as described with no problems. The last sentance of this article described how to change the sense of this circuit, i.e. dim while receiving and bright while transmiting. There is a BIG problem when this is done! It turns out that the spare inverters (U14) he used are powered from the battery backup circuit for the RAM chips. When power is shut off to the board the battery is drained at a high rate; thereby prematurely killing the battery. A warning of this problem appeared in an issue of the Gateway Newsletter from the ARRL.

I still desired a 'normal' sense of PTT, i.e. bright while transmiting. I examined the schematic and noted that besides U14 having spare inverters so does U7. This same chip is used for the PTT functions and its power doesn't come from the battery backup circuit. So, I substituted U7 pin 1 for U14 pin 11 and U7 pin 2 for U14 pin 8. For those of you who do not have the original article I will summarize the modifications required:

1) Remove R34 which is

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originally a 470 ohm resistor. Replace it with a 1.5 K ohm, 1/4 watt, 10% resistor. Before installing it put a small loop in one lead near the resistor body. Install this loop end towards the battery. Be carefull not to touch the battery. Place a piece of tape over the battery first.

2) Cut the ground trace to U7 pin 1 on the solder side of the board. Install a short jumper between U7 pin 1 and pin 9.

3) Hook and solder one end of a 1 K ohm, 1/4 watt, 10% resistor to the loop in the lead of the 1.5 K ohm resistor, the new R34. To the other end solder a length of 30 gage wire-wrap wire. Slip a piece of tubing over the entire length of the exposed body and leads of the 1 K ohm resistor. Solder the other end of the wire to U7 pin 2 on the solder side of the board. Route the wire thru one of the plated thru holes in the board.

Dennis Goodwin, KB7DZ
Technical Vice President, NAPRA

24 HR Duty Power Pack For Your Packet Handheld

If you have an ICOM 2AT, 3AT, or 4AT type handheld that you would like to use on packet, but have been worried about the batteries running down while you are away; this handy curcuit may be the answer. It can be built for around $5.00.

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I got the schematic from Bob Mizener, N7BUW, one day on a napkin at lunch. Since then, I have built several for myself and friends.

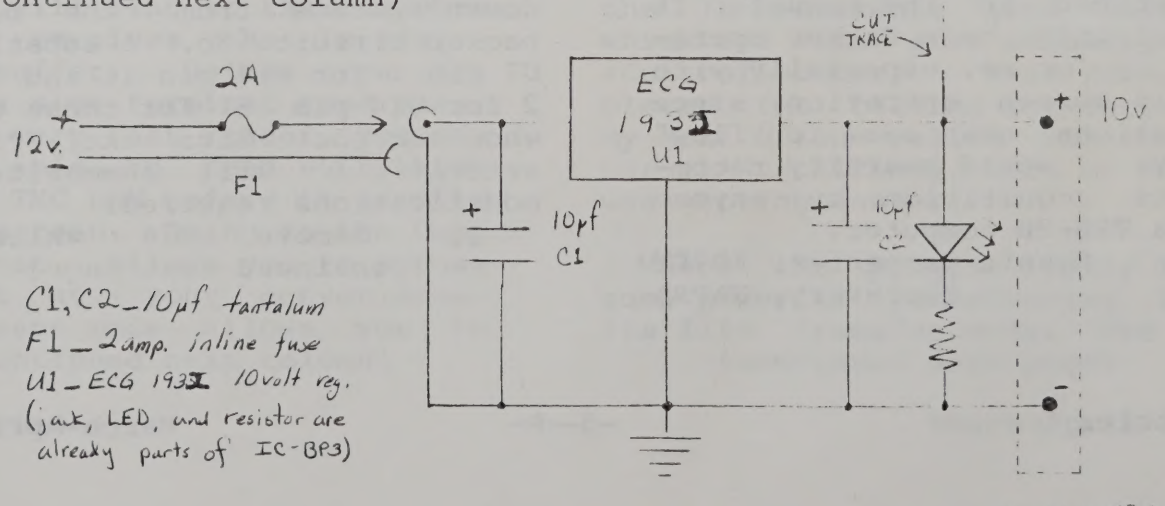
First take the case from a dead battery pack (IC-BP3, the one that originally came with the handheld) and remove the four top and two bottom screws. Open the case and remove the battery cluster.

Holding the half of the case with the components in your hand so that they are at the top, clip the pc board with a pair of diagonal cutters just to the right of the LED, leaving it and a resistor attached. Then cut the positive trace between the coaxial mini-power plug and the LED.

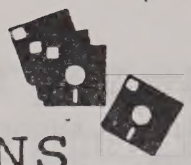
Now mount the two 10 uf tantalum capacitors and the ECG 1932, 10 volt regulator to a half inch square piece of vector board. Bend an aluminum band into the shape of a U so that it will snap tight into the case, allowing space for the head of the bolt that will secure the ECG 1932 and the vector board to the end of the band.

Wire the components as shown in the schematic, taking care to get the polarity of capacitors correct. Note that you should use a 2 amp. fuse in line to the 12 volt supply. Reassemble the case and test for 10 volts with correct polarity before you attach to your handheld.

Bob Churchward, W7RXS



DOWNLOADED:



MAKING SENSE OUT OF BEACONS

In my opinion, there's nothing really wrong with beacons on a packet channel. The problems come from the way people use them. Here's what I mean:

Beacons are NOT inherently bad - their intended purpose is misunderstood and they are frequently misused by newcomers. The beacon can still perform vital functions when properly written and appropriately used. This is especially true as we begin to expand into colateral or additional packet channels on two meters and on the other bands.

Understand the origin of the beacon feature...why it was provided. It really was an important option when the packet radio world was a vast wasteland and we needed efficient means of letting the world know that someone was alive, well and available on the channel and ready for connecting; the beacon also provided an excellent source of test messages for lining up the early TNCs when there were no other means of testing the kits.

As we all know now, packet radio is NO WASTELAND - In many large cities, we already have more users than our primary channel can handle most of the time. For the primary channels in metropolitan areas, the beacon function has outlived its original design intent. Beacons should be re-evaluated and tailored carefully and specifically to present (and future) conditions of channel purpose, assignment and occupancy.

Apparently some users don't know what a beacon text will look like on the distant station's screen.

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They put their callsign in their beacon text, not realizing that their callsign will be displayed in the header text on almost all systems - unnecessary, redundant information.

Apparently some users don't know the default conditions of most TNCs. Nearly all of them (and I have tested five types) will boot up with DIGIPEAT enabled and will perform the digipeat function unless you TELL THEM NOT TO. So, why use the beacon text to advise everyone on the channel of something that can be assumed automatically? - more unnecessary information.

Some users feel the need to tell the channel that their "buffer save to disk is enabled".. that's something else the rest of the users can assume. With the proliferation of the smarter TNCs like the TNC2 types and the PAKRATT, with smart buffers and auto-connect messages, the receiving TNC itself can provide this information AFTER the user connects to it - it's not needed as part of the beacon text.

Some users feel compelled to suggest connection paths in the beacon text... any half-ass TNC with a trace function permits the others on channel to derive the beacon path when and if they need it... more unneeded data.

What is needed in a "meaningful" beacon text? Here's my suggestion:

a) Absolute brevity - minimum bytes to get the idea across.
b) Name of operator
c)..QTH in format (City, State), Grid Locator in format (XXNNnn)

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d)..Special TEMPORARY information, such as test conditions, new operating hours, power reductions, changes in effect, directed messages such as "W2XXX PLS CALL ME URGENT".

e) A generous dose of common sense.

What is undesirable in a "meaningful" beacon text?

a) Anything unessential

b)..Long-winded information that never changes

c) "Cutesy" graphics, such as lines of asterisks, parentheses, center-screen formatting - in short - save the "arts & crafts" for 80-meter RTTY.

d) Ego trip and "show-off" messages

Beacon Timing

There is absolutely no justification for a sending a beacon every one, two or three minutes, and in many metropolitan areas, there's little justification for basing the beacon timing to the "AFTER" routine. On a primary channel like 145.01, there is no harm in an informative beacon every 30 minutes - let's face it: that's all the channel can handle without strangling. That's still 48 beacon messages in 24 hours! On auxiliary channels like 145.03, 05, 07, 09, a beacon every 15 minutes will let the world know you're there...they won't find out any faster if the beacon is sent every two minutes...

Conclusions

Once a user has joined a local packet radio club, or his station has shown up on a packet network map of his area, the rest of the local area users will know who he is, where he is, and in general,

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everything that THEY wish to know about him and his operation. At that point, the beacon will become of less importance and the beacon intervals can be reduced to simply indicate that the station is in fact alive and well on the channel, and available for normal service.

A Wee Packet Philosophy

The only constraint on the use of the beacon feature is the requirement for the generous use of ordinary common sense, lightly tempered with some patience on the part of the "old packet hands", and a more tolerant, more tutorial approach to the "newkids" on our packet radio "block". We can't expect these "newkids" to understand everything about our packet mode the day they first put their packet boxes on the air. The manufacturers' manuals are nearly worthless when it comes to instructions on good on-the-air operating practices and procedures.

It's really up to us to teach each other and help the mode grow in orderly fashion, rather than merely criticize others. Those of us who are fortunate in having more experience and understanding more about packet radio and its unique qualities have a real moral and technical obligation to serve as mentors towards those who know less but want to know more.

Norm Sternber, W2JUP

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Norm Sternberg, the author, is SYSOP of the 'BALD HILL' technical BBS on Long Is land, New York. His system is for licensed amateurs only and he has opinions about just about everything. I visit is system, from time to time, because of that. He also runs runs a packet BBS (W2JUP-4).

--- From Norm Gregory, KA7WNA ---

Packet Frequency Coordination Agreement Reached by WWARA and British Columbia

The following constitutes areas of agreement reached between the Western Washington Amateur Relay Association (WWARA) and PARCFA, the equivalent coordinating body from British Columbia. This agreement was reached at a joint meeting of the directors of both groups on January 26, 1985. At a subsequent WWARA board meeting on February 6, 1986, these guidelines were approved by the board for presentation and adoption by the general membership at the April 5, 1986, general membership meeting.

These guidelines were adopted by the general membership and are now a part of the WWARA coordinating policies.

Two meter digipeaters should be coordinated when the following criteria are met, where:

1. The proposed system will be located at a recognized communications site. A recognized communications site is one where 6 existing communication systems are located.
2. The proposed system will be located at a site that already is used by an existing coordinated amateur radio system.
3. The proposed system is to be located at an unmanned location.

The intent is to protect any existing amateur radio system, using existing facilities. No system, voice or data should be given priority.

Other areas of agreement

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concerning packet operation:

1. No packet operation outside the band 144.9 to 145.1 or outside of recognized band plan repeater pairs should be coordinated or recognized. Any such operation (on simplex frequencies, etc. shall be at the option and discretion of the party making that choice.
2. Parties wishing dual-frequency digital systems should be encouraged to operate conventional, band-plan systems.
3. No preference toward any particular mode should be made by any coordination body.
4. Every effort should be made to protect the operation of any and all coordinated systems, regardless of mode.

Additionally, the position of "Packet Coordinator" was created and will be filled through the appointment of an individual to be recommended by NAPRA, the Northwest Amateur Packet Radio Association.

de WB7DCH

PACKET RAGCHEW
EVERY THURSDAY AT 9 PM
145.33 REPEATER
+++++++
ONE HOUR EARLIER ON
3877.5KHz

PK64>BEACON:Command Review

Here is a list of commands for those who are using AEA's MBA-TOR software or the Morse, Baudot, ASCII, AMTOR portion of the Pk64 on hf, as copied from K9TBD on 2Ø meter AMTOR: BRIEF COMMANDS FOR MBA-TOR BY K9TBD 12/15/85.

F1 - RECEIVE / TRACKING RESET/ LOWERCASE RESET
F2 - CLEAR QSO BUFFER
F3 - TRANSMIT
F4 - CLEAR XMT BUFFER
F5 - CHANGE SPEED
F6 - INVERT (EXCEPT CW)
F7 - SPEED LOCK/GUESS (TOGGLE)
F8 - TOGGLE PRINTER
CTL F1 - TOGGLE RECORDING TO QSO BUFFER
CTL F3 - BREAK IN BUFFER
CTL F5 - SET CTL X BUFFER

*** EDIT COMMANDS ***
CTL CURSOR RIGHT - CHANGE CASE
CURSOR KEYS - DO THEIR THING
F1 - PAGE UP
F3 - PAGE DOWN
HOME - FIRST CHAR IN BUFFER
CLR - CLEAR FROM CURSOR TO END OF BUFFER
DEL - DEL CHAR UNDER CURSOR
CTL DEL - DEL 4Ø CHARS, ONE LINE STARTING AT CURSOR
INSERT - TOGGLE INSERT MODE
SHIFT AND SHIFTLOCK - TOGGLE BETWEEN UPPER A D LOWER CASE
RUN/STOP - STORES BUFFER
LEFT ARROW - DELETE ONE CHARACTER TO LEFT

*** OTHER FUNCTIONS ***
COMMODORE LOGO SHIFT - CHANGE CASE
CTL Ø-9 - SOLICIT MESSAGE BUFFERS
CTL D - RETURN TØ STANDBY (AMTOR)
CTL E - RETURN TO RECEIVE
CTL I - CW ID
CTL U - TRANSMIT FILE FROM D: OR C: USED BEFORE AND AFTER
CTL T - INSERT TIME
CTL M - CARRAIGE RETURN
CTL J - LINEFEED
CTL L - LETTERS KEY
CTL N - FIGS KEY
CTL X - SEND CTL X BUFFER
CTL #/- PHASING

*** BUFFER SIGNIFICANCE ***
BUFFER 5 - AUTOCAL SEND MESSAGE (AMTOR)
BUFFER 6 - BEACON (AMTOR)
BUFFER 7 - SEND BUFFER (AMTOR)
BUFFER 7 - SELCAL (RTTY) #NNNNNNN# IS SELCAL BUFFER END IN CTL E
BUFFER 8 - RESPONSE E.G. TNX IN (AMTOR)
BUFFER 8 - RTTY PRINTER CONTROL BUFFER

*** MORSE CODE ***
PLUS - SK
AT - AS
STAR - AR
UP AR - KN
EQUAL - BT
ENGLISH POUND - AA (NEW LINE)
EXCLAM - SN
PERCENT - KA (ATTENTION)

NOTE: # IS USED TO INDICATE THE PLUS SIGN

DE K9TBD

NORTHWEST AMATEUR PACKET RADIO ASSOCIATION
MEMBERSHIP APPLICATION FORM

[] RENEWAL [] NEW MEMBER

PLEASE PRINT

NAME : _____

CALL SIGN : _____

MAILING ADDRESS : _____

CITY : _____ STATE : ____ ZIP : _____

PHONE NUMBERS: HOME : (_____) _____ - _____

WORK : (_____) _____ - _____

PLEASE INDICATE ANY OF THE ABOVE THAT YOU WOULD NOT WANT PUBLISHED IN A MEMBERSHIP ROSTER.

ANNUAL DUES ARE $15.

MAKE CHECK OR MONEY ORDER PAYABLE TO "NAPRA"

SEND TO : NAPRA Sec./Tres. WB7FHC
Budd Churchward
13304 131st Street KPN
Gig Harbor, WA 98335

OPTIONAL QUESTIONAIRE

1. Packet TNC(s) : _____

2. Computer(s) on packet : _____

_____

3. Band(s) : _____

4. Radio(s) : _____

_____

5. Technical expertise (1 = low, 5 = high) :

Audio Frequency : _____ Radio Frequency : _____

Digital Hardware : _____ Digital Software : _____

NORTHWEST AMATEUR PACKET RADIO ASSOCIATION
MEMBERSHIP APPLICATION FORM

[] RENEWAL [] NEW MEMBER

PLEASE PRINT

NAME : _____

CALL SIGN : _____

MAILING ADDRESS : _____

CITY : _____ STATE : ____ ZIP : _____

PHONE NUMBERS: HOME : (_____) _____ - _____

WORK : (_____) _____ - _____

PLEASE INDICATE ANY OF THE ABOVE THAT YOU WOULD NOT WANT PUBLISHED IN A MEMBERSHIP ROSTER.

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_____

5. Technical expertise (1 = low, 5 = high) :

Audio Frequency : _____ Radio Frequency : _____

Digital Hardware : _____ Digital Software : _____

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